

# RESEARCH BRIEF

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## Children's Media Use and Sleep Problems: Issues and Unanswered Questions

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### Introduction

Among the many blessings parents seek to pass on to their children, a life of good sleep habits is an unglamorous but important one. Sleep is the subject of some confusion and considerable anxiety among parents of infants, but fades gradually to an afterthought among most parents of older children, who struggle to maintain busy schedules, enforce homework, and endorse healthy social lives. In the effort to balance these needs, children's sleep often takes a back seat.

Short-changing sleep has serious adverse consequences. American children get too little sleep, with major adverse implications for their cognitive ability, judgment, behavior and physical health.

Although there are many reasons for the lack of adequate sleep among children, media use is frequently cited as one probable culprit. Yet a comprehensive review of the scientific literature found just five articles from the U.S. and four international academic articles analyzing data on media use and sleep. All nine found some significant associations between media use and indicators of sleep quantity or quality, although three of the articles also reported non-significant associations for certain ages or certain sleep-related outcomes.

But given the many changes in young people's media environments, this evidence base is out of date. There is good reason to believe that different media *formats* (e.g. television viewing, Internet use, cell phone use, electronic game-playing) will have different kinds of effects on sleep. Different *content* types within these formats will presumably also have different effects—indeed it is possible that certain media content in certain formats can function as a healthy part of bedtime routines. Finally, the effects of media use at different *times* of day have rarely been explored.

There are many holes in the literature on media use and sleep. This issue brief reviews the limited literature that does exist, summarizes what is known about media use and sleep, and suggests what the important questions are that remain to be answered.

### Importance of Sleep to Children

A rich literature demonstrates a robust association between poor sleep and a host of problems for children. Nearly every problem of concern to parents and pediatricians can be brought on or exacerbated by inadequate sleep: from obesity to aggression to hyperactivity.<sup>1,2</sup>

### The function of sleep

When we sleep, we are at rest, but our brains are not. They are active, and their activity is essential to almost all of the body's business: to the consolidation of memories, to learning, to cognitive development, to psychiatric health, to healthy immune function, and to bodily growth and repair.<sup>3,4</sup>

Sleep researchers recognize the importance of two fundamental dimensions of sleep adequacy: sleep quantity (total sleep time) and sleep quality. These dimensions cover several attributes of sleep: *total sleep time*, adversely affected by late bedtimes, early waking, and sleep onset latency (delay between bedtime and falling asleep); and *sleep quality*, including nighttime wakings, nightmares, disturbed sleep-wake transitions, and irregular bedtimes.

The first system to suffer from inadequate sleep appears to be executive function, or the brain's ability to plan, organize activities, and pay attention.<sup>5-8</sup> Other research has shown that inadequacies in sleep quantity or quality among children and adolescents are associated with significant impairments in immune function, the regulation of metabolism (thereby creating an association between sleep and obesity and diabetes),<sup>9</sup> creativity and memory<sup>10</sup>, accidents and injuries,<sup>11</sup> school failure,<sup>12,13</sup> and behavior.<sup>14</sup>

The causality between poor sleep and many of these outcomes probably runs in both directions. A study focusing on sleep and behavior problems, however,<sup>14</sup> presented evidence that a large part of the association can be explained by the effect of poor sleep upon behavior problems. Some of the studies have assessed randomly assigned sleep restriction to isolate the causal effects of sleep, and have verified that it is sleep that causes problems in, for example, executive function.<sup>6</sup> Results such as these verify at least some causal role of poor sleep in the etiology of such problems.

One of the striking findings of research in this area is how important even relatively small sleep impairments can be. One recent study found that an ongoing sleep deficit of just one hour per day over three days can result in significant degradation in neurobehavioral function.<sup>6</sup> Another found that a difference of just 25 minutes per night of sleep duration was associated with changes in school performance among adolescents.<sup>12</sup>

While there is still much research that needs to be done to fully understand the functions of sleep, there is no question that adequate sleep is essential to proper development and to good physical and mental health.

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A recent Institute of Medicine report estimates the costs of inadequate sleep in the U.S. population to run into the hundreds of billions of dollars annually.<sup>15</sup> Since good sleep is a lifelong habit, improving children's sleep would benefit them directly and have significant beneficial long-term impact on the nation's health and economy.

### **Sleep trends among children**

Recent research in the United States suggests that most children do not regularly get an amount or quality of sleep that would ensure optimal development and health.

A 1981 study of children ages 1–5 in the U.S. identified average total sleep times of 11.5–13.5 hours. Twenty-five years later, a 2005 study of a similar sample of 1–5-year-old children identified average total sleep times of 9.5–11 hours.<sup>16</sup> While the methodologies of these studies differed sufficiently to make them not directly comparable, the results suggest a decline in children's sleep time that mirrors the decline in adult sleep times.<sup>17</sup> Yet another recent study found that children ages 1–5 sleep an average of 8.7 hours per night.<sup>16</sup> While the amount of sleep that would be judged adequate for this age range is unclear, it is almost certain to be more than the reported amount in this study.

Less research has been done on the epidemiology of problems with the quality of sleep. An estimated 20–30% of young children have some type of sleep problem, but such problems often subside as children enter elementary school.<sup>18</sup> By elementary school, 18% of children are reported to have fragmented sleep.<sup>19</sup>

For adolescents, inadequacy of both sleep quantity and sleep quality is particularly acute. Changes brought on by puberty imply that children need no less and often more sleep than before puberty, but that the physiology of sleep timing shifts later.<sup>2</sup> At the same time, the social pressures and increasing independence of the teenage years lead adolescents to get less sleep than before. These opposing forces squeeze sleep out of the teenager's busy schedule, and lead to a yawning sleep deficit: while teens typically need about 9 hours of sleep, they typically obtain only about 7 hours of sleep.<sup>2,12</sup> The difference is made up by sleeping late on weekends, by sleeping in class, or is not made up at all, with damaging implications for health and alertness.

### **How Media Use Might Impact Sleep**

Many parents believe that their own experience with the media when they were children is a good guide for managing their children's media use today. Yet major changes over the last 25 years in the *format, fungibility, extent, location* and *content* of today's media have been so profound that the experience of a generation ago is in fact a poor guide to appropriate practice today.

- The past 25 years have seen the rise of the Internet (use of the Web, e-mail, chat rooms, instant-messaging) and video games (computer games, console games, and Internet-based games). These kinds of **media format** have made media use not only more attractive, but more immediate and emotionally salient. The interactivity of these forms enhances engagement and leads to a corresponding increase in alertness hormones, and reduces the ability to disengage from the activity in a timely and self-directed manner.

- The rise of DVDs and digital video recorders (DVRs, e.g., TiVo) represents a major advance in the time **fungibility** of media use. Such "time-shifting" makes it possible to extend television viewing late into the night. Other forms of media such as Internet use and cell phones are inherently fungible as well.

- For the most part, the average number of hours spent watching television among children over age five has changed little in the past generation. By contrast, television and video/DVD viewing among very young children has increased dramatically.<sup>20–22</sup> The average age of beginning to regularly watch television, which had been almost 3 years old in 1961,<sup>23</sup> has now declined to just 9 months old.<sup>24</sup> There has also been a considerable increase in the **extent** of other forms of media use, including Internet use and games,<sup>22</sup> nonexistent a generation ago, and also phone use, which has ballooned with cell phones, cheaper phone rates, and text messaging. All told, children age eight and over were found in 2005 to consume an average of an additional hour of media content per day compared to 1999; and an average of one-fourth (26%) of their media use time was spent "media multitasking," or using more than one medium at a time.<sup>25</sup>

- The reduction in prices of electronics has made it possible for many children to have a television, computer, or private phone in their own bedroom.<sup>22</sup> While not entirely new, this change in the **location** of media use has over the past 25 years made it possible for children's media use to be increasingly outside the ambit of parental monitoring.

- In the past generation there has been a gradual but objectively measurable shift in the **content** of television and movies—including those targeted at and frequently watched by children—which have become more conflictual and violent, more sexualized, and more commercialized.<sup>26–34</sup> At the same time, there has been an increase in the development of content specifically for the very youngest children, some of it designed explicitly to help children calm down and transition to sleep at the end of the day.

Several theoretical explanations have been advanced in the literature to explain why media use might have an impact on the amount and quality of sleep that children receive:

#### **Media use of all kinds might directly displace sleep.**

Several authors have pointed out that media use such as Internet, electronic games and phone use has an unstructured time profile, with no defined beginning or ending time. Television viewing has a defined endpoint when a show ends, but producers are energetic in their efforts to retain viewers for a subsequent show. As such, it is argued, media use of all types is likely to bring about time displacements, especially of sleep.<sup>35–37</sup> This theoretical reasoning suggests not only that media use could affect the total amount of sleep, but also that it would adversely affect sleep quality by fostering irregular bedtimes.

**Media use that involves excitement, suspense, drama, and conflict may be too exciting for children, especially at bedtime.** Viewing exciting or violent content—whether actual or implied—is known to be associated with physiological changes consistent with increased stress and arousal hormones.<sup>38, 39</sup> Young children may be particularly susceptible to these effects.<sup>38</sup> Because secretion of these hormones is associated with increased delay of sleep and poor sleep quality,<sup>3, 40</sup> it is likely that viewing exciting or dramatic content delays sleep onset and reduces sleep quality.<sup>37</sup> Beyond direct physiological effects, viewing frightening, conflictual, or violent content may produce nightmares and associated night wakings, a significant contributor to poor sleep quality.<sup>37, 41-43</sup> These reactions are not limited to frankly violent adult fare, but include seemingly innocent children's programs and the television news as well.<sup>41, 42</sup>

**Exposure to light during media use suppresses melatonin secretion, which delays sleep onset.**

Sleep is brought on by many physiological factors, with melatonin production chief among them. Melatonin production increases in the evening in response to decreasing ambient light levels. For this reason, it has been hypothesized that many forms of media use involve sufficient light exposure from displays to delay melatonin release, and therefore to postpone sleep. Because the intensity of light decays with the square of the distance from its source, this mechanism is particularly plausible with computer and video game use, in which the viewer is very close to the screen. One experiment confirmed that exposure to a bright display in the context of an exciting game was sufficient to delay melatonin production.<sup>44</sup> On the other hand, a dim display did not produce such an effect, which suggests that the light effect can be mitigated by changing the brightness of the screen. By contrast, the light produced by a television set viewed at a typical distance is not enough to have an effect on melatonin secretion.<sup>28</sup> However, if television is watched in a bright room, the room lights may be adequate to delay melatonin production, and therefore retard sleep onset.<sup>28</sup>

**Physical activity, which promotes good sleep, can be displaced by media use.** Because good sleep is fostered by physical activity, it has been hypothesized that part of the effect of media use on sleep quantity and quality operates through a displacement of physical activity.<sup>35, 45</sup> While plausible, this mechanism is not well supported by evidence on media use and physical activity. The evidence that media use displaces physical activity is quite thin in cross-sectional studies, and a randomized trial of a television-reduction protocol among 9-year-olds found an effect on television viewing but no effect on physical activity.<sup>46</sup>

**Some media may calm children and promote sleep.**

While much of the research community is concerned with the ways in which media use can interfere with adequate sleep, parents and children are increasingly turning to media as part of their bedtime routines. Television programming is being consciously designed to help children wind down at the end of the day and transition to sleep. To date, there is no published research on the effectiveness of this type of content, but focus groups have indicated that some parents find such shows helpful, and are using them as part of their children's bedtime routines.<sup>22</sup>

Among children age eight and older, two-thirds have a TV in their bedroom.<sup>25</sup> Even many younger children have their own TV. Several recent studies have documented that about one-third of children ages 10 and under have a television in their bedrooms.<sup>22, 35, 47, 48</sup> These numbers are lower for younger children in this range,<sup>22</sup> and higher for low-income children.<sup>48</sup> A 1999 study of elementary school children reported that three-quarters use television viewing as part of their bedtime routine.<sup>35</sup>

Half of parents of children ages 0–6 report that TV can help to calm their child, which may explain part of its appeal as part of a bedtime routine.<sup>22</sup> This calming effect is at odds with research on adult viewing experiences, which find that on average TV viewing leaves adults less relaxed than before they started.<sup>49</sup> Because the content that adults watch is often quite different than that viewed by young children, it is likely that the content is important to the calming effect of media. While this hypothesis has considerable face validity, it has never been explicitly researched.

There may also be important differences in how children of various ages respond to TV. Teenagers frequently watch adult-like content, which is presumably not relaxing in a physiological sense.

One of the striking insights to emerge from a consideration of the theoretical perspectives on children's media use and sleep is that there is nothing inherent in most media use that would make it damaging for sleep. The proposed causal mechanisms are related to content and to the timing of media use, both of which are modifiable and manageable.

## A Thin But Worrisome Evidence Base

As mentioned earlier, a thorough review of the scientific literature on children, media and sleep found a total of nine published studies, five from the U.S. and four from abroad. This section of the issue brief reviews what we do and don't know about how media affect the typical child's sleep.

### Young children

The issues for young children, up to about age 10, are different than those for adolescents. This difference in effects arises because of different types of content typically experienced, and because the increasing independence of adolescent children makes it more difficult for parents to monitor and guide their media experiences.

The best way to assess the effects of media use on sleep would be to conduct a randomized, controlled trial, in which children are randomized to either a media-reduction group or a control group, and then their sleep quantity and quality are compared. A series of trials would be required to separately identify the effects of media content, media format, and timing of media use on children's sleep. While expensive, such research would provide clear results, and would form the foundation of clear, unambiguous guidelines for parents and policy-makers.

The research that does exist is almost entirely cross-sectional: a sample of children is recruited, and their sleep times and media use are assessed. While these

studies provide some important descriptive insights about patterns of media use and sleep, they leave important questions unresolved. Chief among these unanswered questions is whether an association between heavy media use and poor sleep is an indication that the media use causes poor sleep; or whether children who are poor sleepers for some other reason are more likely to use media heavily. It is also possible that some third factor, such as lax parenting or a physical health problem causes both heavy media use and poor sleep. With a few exceptions, these issues are important caveats to the literature in the field.

Concern about media use and sleep in children dates at least to the 1970's, and probably much before. A 1981 study of middle-class children in Indiana found a significant association between TV viewing and both shorter daytime naps and shorter nighttime sleep among toddlers.<sup>50</sup> Such results have been replicated subsequently and seem to have grown stronger with time. Three recent studies of elementary-school children found that the amount of television viewed per day is significantly associated with lower total sleep time and with a general measure of sleep disturbance.<sup>35, 51, 64</sup> An equally strong predictor in one study was bedtime viewing, but the strongest predictor was having a television in the child's room.<sup>35</sup> The fact that a TV in the bedroom was significantly associated with sleep problems, even controlling for parentally reported total viewing time, raises the possibility that having a TV in the bedroom makes it possible for children to watch before bedtime without the parents' knowledge.

**Sleep quality** has also been related to media viewing. A recent study of infants and toddlers found that the amount of television viewing is associated with both irregular naptimes and irregular bedtimes.<sup>52</sup> This finding is cause for concern given, on the one hand, the extent of infant and toddler viewing,<sup>22, 24</sup> and on the other the importance of regular bedtimes and naptimes to healthy sleep habits.<sup>40</sup>

### **Adolescents**

The issues and empirical results for adolescents are similar to those for younger children. Although one early study from 1981 found no association between television viewing time and total sleep time among children ages 5–16 years old,<sup>50</sup> other research suggests that these findings may be outdated. A 2007 study of 1,267 U.S. adolescents found that television viewing and computer use were each independently associated with later bedtimes and less overall sleep,<sup>64</sup> a result similar to that of a 2004 Flemish study. This research also showed that unlike other disruptions of sleep, the reduction in sleep associated with media use was not compensated for by greater sleep on the weekends. Rather, the media-induced sleep reductions represented a true loss in total sleep time, and the media use was associated with significantly higher levels of self-reported overall tiredness.<sup>36, 53, 64</sup>

The best study to focus on adolescents was a longitudinal study conducted with 759 adolescents at mean ages 14, 16, and 22.<sup>45</sup> This study found that the amount of television viewing at age 14 was significantly associated with trouble falling asleep as well as with the number of sleep problems experienced at age 16 or at age 22, controlling for sleep problems at age 14 as

well as for a host of socio-demographic covariates. The study further found that reductions in television viewing between 14 and 16 years of age were associated with fewer sleep problems at age 16 or 22 years. By contrast, the study found no effect of sleep problems at the earlier times with TV viewing at the later times. Because of its longitudinal design and the careful execution of its analyses, this study presents the strongest evidence of any published that television viewing is causally related to sleep problems. In particular, as the authors note, these findings "...suggest that extensive television viewing during adolescence may be associated with the development of frequent sleep problems among youth who have not previously had frequent sleep problems."<sup>45</sup>

### **Media other than television**

Although the research on television viewing and sleep is thin, the research on other media formats is all but nonexistent, and what little there is comes primarily from other countries. Surfing the Web is associated with delayed sleep among elementary-school children.<sup>19</sup> The playing of computer games after 8 p.m. is associated with less total nighttime sleep among Saudi grade-school children.<sup>54</sup> A study in Japan found that playing computer games more than an hour a day (as opposed to not at all) was associated with a greater prevalence of black rings under the eyes.<sup>55</sup>

It has been anecdotally reported that many children take their cell phones to bed with them, sometimes for conversation, but more often for text-messaging. A letter to the editor in a major sleep journal reported that about 24–40% of adolescents in Belgium reported being woken up at night once a month or more often by incoming text messages on mobile phones.<sup>56</sup> Such children reported significantly higher levels of daytime sleepiness than children who were never woken up by text messages.

### **Passive vs. active viewing**

Most of the research attention so far has been devoted to "active" or "foreground" or "primary" media use, in which the child or adolescent is actively watching the screen as a primary activity. Yet recent advances have suggested that for many of the developmental effects of television viewing, background viewing, in which the television is on but is not being watched as the child's primary activity—is equally important and may indeed have more deleterious effects than primary viewing.<sup>57</sup>

One study tested the association of passive TV exposure with children's sleep, and found not only that passive viewing had a significant effect, but that the association of passive viewing with a summary sleep problem score was in fact *stronger* than that for active viewing.<sup>51</sup> This result may have arisen because the passive viewing to which the children were exposed was more stressful than the content that they were watching actively, which was presumably children's fare. This result clearly warrants further research, particularly given the amount of adult viewing that happens in the presence of children.<sup>57, 58</sup>

### **Media use and nightmares**

Several studies using a variety of methodologies have shown that many children suffer occasionally from nightmares resulting from something they experienced on TV or in an electronic game, and most children have

suffered from such nightmares at least once in their lives.<sup>37, 41-43, 59-61</sup> Approximately two-thirds of children have had at least one fright response from television that lasted more than two weeks.<sup>43</sup> A population-based survey of elementary school children found that 9% of parents report that their children have weekly television-related nightmares.<sup>35</sup>

What scares children differs by age. Before about 8 years of age, children are most frightened by the immediate sights and sounds on the screen, such as screams, loud arguments, and scary-looking creatures. Older children are more frightened by dramatizations of events that they perceive as posing a credible threat to themselves—such as war, crime, or natural disasters. Not only are television and movies full of such content, but it shows up ubiquitously on television, including in content that may seem innocent or that is specifically designed for children.<sup>28</sup> Advertising during other innocuous programming poses an additional risk.<sup>28</sup>

While the existing research has been largely limited to TV, its implications carry over to other media formats, such as playing violent games, or experiencing threatening content on the Internet. A content analysis of best-selling video games found that nearly 90% contain violent content.<sup>62</sup>

The limitation of this literature is that it is very difficult to assess the magnitude of the effects for typical children on the strength of the existing research. To show that nightmares can be provoked by viewing frightening content does not demonstrate that typical media use provokes nightmares frequently enough to degrade average sleep quality. Even frequent viewers of violent content might not regularly suffer from nightmares or night wakings.<sup>37</sup> A study of 495 elementary school children found no significant effect of viewing of violent fare on night wakings or total sleep disturbance.<sup>35</sup> Of course, nightmares can be provoked by content that is not explicitly violent, such as news programs or children's shows.<sup>37, 43</sup> All the same, this research suggests that the effects of violent viewing on sleep quality may be modest, infrequent, or limited to especially susceptible children.

#### **Parental monitoring and management**

As this review suggests, the relationship between media use and sleep is a complicated one, and the existing research about it permits few definitive statements. Part of the complication arises from the fact that children's media use is a social phenomenon, shaped by the interactions among parental monitoring and rules, a child's personality, and changing developmental needs.

The problem of children circumventing parental guidance about sleep and bedtimes is hardly new. Social norms in the United States suggest that good sleep hygiene is the parents' responsibility.<sup>40</sup> For young children, this is a responsibility that is taken seriously, if not always worn lightly. In adolescence, a parent's job becomes much more difficult. Because adolescents are shifting their circadian rhythms, and because of persistent peer pressure, there is a tremendous temptation for teenagers to go to sleep late, despite early wake-times enforced by school schedules.

Media use is an important part of the sleep ecology for children and adolescents. How, when, and why media are used are important determinants of its effects on sleep. For example, many parents have televisions in their children's bedrooms and allow them to watch alone so that they (the parents) can watch their own shows undisturbed.<sup>22</sup> Yet a television in the bedroom is associated with more viewing and later viewing.<sup>22, 47</sup> On the other hand, if children are not otherwise occupied when parents watch, they may be indirectly exposed to parental viewing, which may have adverse effects on their sleep as severe or worse than that of children's viewing.<sup>51, 57</sup> Parental viewing may therefore have an important impact on children's sleep, through its effects on the form and extent of children's viewing.

#### **Unanswered Questions**

The existing research suggests a consensus around two important points:

- In general children and adolescents are not getting enough high-quality sleep, and the consequences of sleep inadequacies are both meaningful and wide-ranging; and
- Many children and adolescents use media at times and in ways that could interfere with adequate sleep quality and quantity.

However, there are many more *unanswered* questions that emerge from an overview of this literature:

- What are the effects of media use as a sleep-aid for infants, toddlers and preschoolers? Do certain types of media content *help* children transition to bedtime?
- What is the prevalence of *new* media use—such as Web-surfing, instant-messaging, text-messaging, and electronic gaming—in the evening and at (and after) bedtime?
- How does new media use affect sleep quantity and sleep quality among children and adolescents?
- Do children form media habits around bedtime that are difficult to change for the better as their tastes for different content and timing of media use develop through adolescence?
- Could interference of sleep at an early age lead to persistent problems of the sort identified in cross-sectional research, even if the sleep problems are subsequently addressed?

Some of these issues are discussed in more detail below.

#### **Infant and toddler viewing: Is it relaxing?**

Many parents of young children use television as a part of the bedtime routine.<sup>22</sup> While television appears to be relaxing for children of preschool age and older, the issues are quite different for younger children. It is known that at around 2½ years of age, children have developed sufficiently cognitively to be able to engage television content at this level.<sup>57</sup> Because television cannot engage children cognitively before this age, the attention of very young children is sometimes kept via the orienting response to formal features, such as quick edits, rapid action, and a salient soundtrack. It is possible that very

young children who are exposed to this kind of media do not find it relaxing. On the other hand, there are also new television programs that have been specifically created to calm children down and help them fall asleep, and are promoted to parents as such. In many homes, these and other "calming" shows have become part of the bedtime routine.<sup>22</sup> More research is required to assess the effects of different types of content on children's relaxation and alertness at different ages.

#### **New forms of media use: How is their effect on sleep different?**

Many of the insights derived from research on television viewing probably carry over to newer forms of media centered around electronic games, computers, text messaging, and the Internet. Yet there are many attributes of these new media that might make their effects on sleep more intense, or at least different. Many of these newer forms of media involve the participant more interactively (e.g., electronic games, instant messaging), involve closer physical proximity to a light source (e.g., Web-surfing), or involve more interpersonal and emotional saliency (e.g., MySpace surfing, instant messaging). The implications of these differences have yet to be fully explored.

#### **Longitudinal effects: Is there a critical window?**

Sleep problems in middle childhood tend to be persistent.<sup>40,63</sup> This fact raises the question as to what, if any, are the long-term effects of media use on children's sleep. It may be, for example, that there is a critical window early on in which good sleep habits are established. One prominent sleep researcher has argued that sleep problems in early childhood may have adverse developmental impacts that are not fully observable until years later.<sup>40</sup> This researcher speculates that early sleep deprivation in children is part of the cause of Attention-Deficit Hyperactivity Disorder (ADHD). If there is any value to these speculations, media use that interferes with the establishment of good sleep habits may have a persistent effect even if the media use itself is corrected. Long-term effects of media use on other developmental outcomes (such as aggressive behavior, attentional capacity, and cognitive development) have been identified in longitudinal analyses. It is accordingly plausible that early media use might have a similar long-term impact on sleep.

More longitudinal research on the developmental aspects of sleep in general and on the persistence of media impacts in particular would be valuable in generating important research insights and informing public health educational campaigns.

#### **Habit formation: Do good early habits become bad habits over time?**

Media use around children's bedtimes often starts at a young age, with a short episode of soothing content. At this age, the content, timing, and duration of media use are controlled by the parent. A question arises, however, as to whether this media use creates an association with bedtime that is difficult to break as children get older. Such an association could present a problem if children develop an interest in less calming content as they get older, or if they begin to resist or circumvent parental rules about the timing and duration of bedtime media use.

While such issues could affect children as young as grade-school age, they become particularly salient as children enter adolescence, both because teenagers are more interested than younger children in violent and exciting media use, and because teenagers insist on independence from parental guidance.

Anecdotally, some parents have noticed in their teenagers a tendency toward extremely late bedtimes, fueled by games, movies, and caffeine, despite obvious symptoms of sleepiness during the day. It is possible that hidden in the averages that characterize the formal research on media and sleep there are some children and teenagers who have dysfunctional levels or times of media use. This is a topic to which there should be more academic attention.

#### **Conclusion**

William Dement, a professor at Stanford University and a leading sleep researcher has written, "...my most significant finding is that ignorance is the worst sleep disorder of all." This review of the literature on sleep and media use among children indicates that while there are some things we do know about media and sleep, there is much more about which we are still ignorant.

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